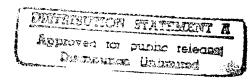


PROGRAMMING AND IMPLEMENTATION DOCUMENTATION

FEASIBILITY STUDY FOR INSTALLATION OF UMCS FORT RILEY, KANSAS

ENERGY ENGINEERING ANALYSIS PROGRAM (EEAP)

Prepared for



U.S. ARMY CORPS OF ENGINEERS KANSAS CITY DISTRICT KANSAS CITY, MISSOURI

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Under

U.S. ARMY ENGINEER DISTRICT, MOBILE INDEFINITE DELIVERY A-E CONTRACT CONTRACT NO. DACA01-94-D-0033 DELIVERY ORDER NO. 0001



DENVER, COLORADO ATLANTA, GEORGIA

DEPARTMENT OF THE ARMY

CONSTRUCTION ENGINEERING RESEARCH LABORATORIES, CORPS OF ENGINEERS P.O. BOX 9005 CHAMPAIGN, ILLINOIS 61826-9005

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Marie Wakeffeld, Librarian Engineering

PROGRAMMING AND IMPLEMENTATION DOCUMENTATION

FEASIBILITY STUDY FOR INSTALLATION OF UMCS FORT RILEY, KANSAS

ENERGY ENGINEERING ANALYSIS PROGRAM (EEAP)

Prepared for

U.S. Army Corps of Engineers Kansas City District Kansas City, Missouri

Under

U.S. Army Engineer District, Mobile Indefinite Delivery A-E Contract Contract No. DACA01-94-D-0033 Delivery Order 0001 EMC No. 1406-001

December 1995

By

E M C Engineers, Inc. 2750 S. Wadsworth, Suite C-200 Denver, Colorado 80227 303/988-2951

1. COMPONENT ARMY	FY 1995 MILITARY C	ONSTRUC	CTION PROJECT	T DATA	2. DATE DEC 1995
3. INSTALLATION AND LOCATION Fort Riley, Kansas				ssewide Utility M System (UMCS)	lonitoring
5. PROGRAM ELEMENT	6. CATEGORY CODE	7. PROJEC	ET NO.	8. PROJECT COS 5,8	
	9. COST ES	STIMATES			
Г	ТЕМ	U/M	QUANTITY	UNIT COST	COST (\$000)
Provide PC-based Central Operator S Processor, Remote Control Units, Units sensors, and actua	o include 190 buildings. front-end computers, station, Communication e Control Units, Auxiliary any Control Units, ators. Provide fiber optic to the 190 buildings on	LS			4,698
Estimated Contract Co	est				4,698
Contingency (10%)					470
Subtotal					5,168
Supervision, Inspection Design Cost (6.0%)	n and Overhead (7.0%)				362 310
TOTAL REQUEST TOTAL REQUEST (R	OUNDED)				5,840 5,840

10. DESCRIPTION OF PROPOSED CONSTRUCTION

Construct a Utility Monitoring and Control System (UMCS) to monitor and control HVAC systems, and the utilities serving 190 buildings at Fort Riley. The UMCS will replace the existing HVAC control systems and energy monitoring and control system (EMCS). The UMCS would consist of PC-based front-end computers communicating to building control units. Other associated items include software, fiber optic data communication systems, instrumentation, documentation, training, and testing of equipment.

11. REQUIREMENT

This project is required to correct local HVAC control problems and deficiencies, in order that environmental cooling and heating are adequately provided for active duty personnel at Fort Riley. This project will replace the existing local loop HVAC controls system with a new UMCS. The UMCS will monitor and control the facilities' HVAC systems, and utilities. This project will reduce the natural gas consumption, electrical consumption, and electric demand of HVAC systems through UMCS control technology. An immediate utility savings would be recognized.

1. COMPONENT ARMY	FY 1995 MILITARY CONSTRUCTION PROJ	JECT DATA	2. DATE DEC 1995
3. INSTALLATION AND LC Fort Riley, Kansas			
4. PROJECT TITLE Install Basewide l	Utility Monitoring Control System (UMCS)	5. PROJECT	NUMBER

11. REQUIREMENT (continued)

The project will include the following items of work:

- The UMCS will include PC-based front-end computers communicating to building Control Units, to control and monitor HVAC systems.
- Existing automatic temperature control equipment will be removed and disposed of. Some
 end control device components will be reused in the new UMCS and will be checked and
 commissioned into operating condition.
- New Direct Digital Control (DDC) components will be installed, to provide the required sequences of operation, input/output functions, and monitoring functions, including necessary software, hardware, instrumentation, communications, training, and documentation.
- The field hardware in the 23 buildings on the existing EMCS will be replaced.

Modifications or repairs to the existing mechanical and electrical equipment would be provided to assure a complete, well operating control system.

Additionally, the project will result in a more functionally efficient system providing greater reliability and more accurate temperature control, and will yield significant savings in operating costs by a more accurate and precise operation of air handling units, boilers, chillers, and other equipment.

Current Situation:

Fort Riley has an existing EMCS connected to 23 buildings. The EMCS was installed in 1985. The EMCS has a central operator station that includes a TI 112 CPU with a 40 megabyte hard drive, a cartridge tape data storage, a color monitor, a TI terminal printer, two dot matrix printers, and telephone modems. The EMCS has three work stations each consisting of a monitor, a telephone modem, and a dot matrix printer located at three remote sites from the central operator station.

Discussions with the EMCS operators at Fort Riley regarding the existing EMCS indicated the system is currently used to its capacity, is energy inefficient, and is technologically obsolete (failing).

1. COMPONENT ARMY	FY 1995 MILITARY CONSTRUCTION PRO	DJECT DATA	2. DATE DEC 1995
3. INSTALLATION AND LO Fort Riley, Kansas			
4. PROJECT TITLE Install Basewide I	Utility Monitoring Control System (UMCS)	5. PROJECT	NUMBER

11. REQUIREMENT (continued)

Impact if Not Provided:

If this project is not funded, a reduction of 211,470 MBtu/yr (223,100,850 MJ/yr) cannot be achieved. The Army will not realize a \$1,525,870 annual energy dollar savings with a 3.95 simple payback and a savings-to-investment ratio (SIR) of 2.3. Excessive amounts of natural gas and electricity will continue to be used, and there will be no contribution to energy reduction goals established for U.S. Army facilities by Army Headquarters.

Supporting Documentation:

Supporting data includes basic engineering calculations which show energy savings. The supporting data was documented and conducted under an Army contract performed by an A-E firm (E M C Engineers, Inc.) in FY 95.

Verification of Savings:

The Fort Riley Army facility uses existing electrical meters and natural gas meters which are read monthly by the local utility companies. Historic monthly electrical and natural gas use data are available and can be obtained for monthly billing periods. The energy use for billing periods prior to the installation of the UMCS can be compared to the energy use for billing periods subsequent to the UMCS installation.

Amount of Energy Conserved:

The amount of energy conserved is estimated to be 211,470 MBtu per year (223,100,850 MJ/yr).

LIFE CYCLE COST ANALYSIS SUMMARY ENERGY CONSERVATION INVESTMENT PROGRAM (ECIP)

			EN	ERGY CONSERV	ATION INVESTMEN	T PROGRAM (ECIP)		
		LOCATION:	Fort Riley		REGION: 2 (Kansas)		PROJECT NO:	1406-005
		PROJECT TITLE:	Feasibility Stu	dy for Installatio	on of UMCS		FISCAL YEAR:	1995
		ANALYSIS DATE:	12/13/95		ECONOMIC LIFE:	10	PREPARED BY:	A. Niemeyer
								·
1.	INV	ESTMENT: Install Bas	sewide UMCS wit	h DDC Controls				
	Α.	CONSTRUCTION COS	Т	=			\$5,167,395	
	В.	SIOH COST	(7.0% of 1A) =			\$361,718	
	C.	DESIGN COST	((6.0% of 1A) =			\$310,044	
	D.	TOTAL COST		+1B + 1C) =			\$5,839,156	
	E.	SALVAGE VALUE OF		MENT =			\$ 0	
	F.	PUBLIC UTILITY COMP					\$0	
	G.	TOTAL INVESTMENT		(1D -1E -1F) =			>	\$5,839,156
2.	ENE	RGY SAVINGS (+) OR (COST (-):					
	DAT	E OF NISTR 85-3273-9	USED FOR DISC	OUNT FACTOR	S:	JAN '95		
		ENERGY	FUEL COST	SAVINGS	ANNUAL \$	DISCOUNT	DISCOUNTED	
		SOURCE	\$/MBTU (1)	MBTU/YR (2)	SAVINGS (3)	FACTOR (4)	SAVINGS (5)	İ
	A.	ELECT.	\$12.10	58,176	\$703,926	8.78	\$6,180,473	
	В.	DIST	\$0.00	0	\$O	9.88	\$ O	
	C.	NAT GAS	\$4.12	153,296	\$631,580	9.53	\$6,018,953	
	D.	COAL	\$0.00	0	\$0	8.95	\$0	
	E.	ELEC. DEMAND			\$190,361	8.53	\$1,623,780	
	F.	TOTAL		211,472	\$1,525,867		>	\$13,823,206
3.	NON	I-ENERGY SAVINGS (+)	OR COST (-)					
٥.	Α.	ANNUAL RECURRING						
		1 ANNUAL MAINTENA			(\$116,206)	8.53	(\$991,237)	
		2 ANNUAL MANHOUR			\$67,824	8.53	\$578,539	
		3			70.7021	8.53	\$0	
		4 TOTAL ANNUAL DIS	SC. SAVINGS (+) / COST (-)	(\$48,382)	0,00	(\$412,698)	
	В.	NON-RECURRING (+/-)						
		ITEM	•	SAVINGS (+)	YEAR OF	DISCOUNT	DISCOUNTED	
			(COST(-) (1)			SAVINGS/COST (4)	
						(TABLE A-2)		
		a.		\$ O	1	0.971	\$0	
		b.					\$0	
ŀ		c.					\$0	
		d.					\$0	
		e.					\$0	
		f. TOTAL		\$0			\$0	
	C.	TOTAL NON-ENERGY	DISCOUNTED SA	VINGS (+) OR	COST (-)	(3A4 + 3Bf4) =		(\$412,698)
4.	FIRS	T YEAR DOLLAR SAVIN	IGS (+) / COSTS	(-)		(2F3 + 3A4 + (3Bf1/Ecc	nomic Life))	\$1,477,485
5.	SIMI	PLE PAYBACK (SPB) IN	YEARS (MUST B	E < 10 YEARS	TO QUALIFY)	(1G/4) =		3.95
6.	тот	AL NET DISCOUNTED S	AVINGS			(2F5 + 3C) =		\$13,410,508
7.	DISC	COUNTED SAVINGS-TO-	INVESTMENT RA	ATIO (SIR)		(6/1G) =		2.30
		(MUST HAVE SIR > 1.	25 TO QUALIFY					

	ENGINEER'S OPINION OF PROBABLE COST	ON OF PROBABI	ОЗ Щ	ST	,				SHEET	-		0F	10
AREA	-	ACTIVITY				LOCATION Ft. Riley, Kansas	:			AMENDMENT NO.	TNO.		
PROJE(PROJECT TITLE						CONTRACT NO						
EEAP, F	EEAP, Feasibility Study for Installation of UMCS	UMCS							-	DACA01-94-D-0033	-0033		
					MATERIAL COST	AL COST		LABOR COST	1	EQUIPME	EQUIPMENT COST	TOTAL COST	COST
			Unit	S				Manhrs					
Line	Item Description	ption	ō	ō	Onit	,	Unit	ber		Chit		Unit	
No.			Meas.	Units	Cost	Total	Cost	Onit	Total	Cost	Total	Cost	Total
1	INSTALLATION OF UMCS												
2	UMCS SOFTWARE/DATABASE		rs	-		\$0			\$144,580		%		\$144,580
3	UMCS CENTRAL EQUIPMENT		ST	-		\$99,180			\$9,828		O\$		\$109,008
4	TRAINING		S	-		\$0			\$73,110		OŞ.		\$73,110
5	DOCUMENTATION AND SUBMITTALS	IITTALS	ST	-		\$0			\$50,000		O\$		\$50,000
9	TESTING		rs	-		0\$			\$197,908		O\$		\$197,908
7	TOTAL FIELD HARDWARE		r.s	-		\$1,452,577			\$968,385		0 \$		\$2,420,962
8	FIBER OPTIC DTM		SI	-		\$326,908			\$217,939		O\$		\$544,847
6	ACM REMOVAL	in the designation of	ST	-		\$2,708			\$11,501		\$1,359		\$15,567
9	RF SYSTEM FOR REMOTE SITE MONITORING	TE MONITORING	r.s	-		\$36,500			\$13,119		\$0		\$49,619
7	FO DTM & EQUIP FOR UTILITY MONITORING	MONITORING	rs	-		\$7,942			\$9,426		O\$		\$17,368
12	SALES TAX		%	0:0		0\$							0\$
13	CONSTRUCTION SUBTOTAL	JBTOTAL				\$1,925,815			\$1,695,795		\$1,359		\$3,622,969
14	OVERHEAD		%	15.0		\$288,872			\$254,369		\$204		\$543,445
15		SUBTOTAL				\$2,214,688			\$1,950,164		\$1,562		\$4,166,414
16	BOND		%	2.5		\$55,367			\$48,754		\$39		\$104,160
17		SUBTOTAL				\$2,270,055			\$1,998,918		\$1,601		\$4,270,574
18	PROFIT		%	10.0		\$227,005			\$199,892		\$160		\$427,057
19		SUBTOTAL				\$2,497,060			\$2,198,810		\$1,761		\$4,697,632
70	CONTINGENCY		%	10.0		\$249,706			\$219,881		\$176		\$469,763
21	GRAND TOTAL					\$2,746,766			\$2,418,691		\$1,938		\$5,167,395
22	SIOH COST		%	7.0									\$361,718
23	DESIGN COST		%	0.9									\$310,044
24	CURRENT WORKING ESTIMATE	TE											\$5,839,156
22													
56	1ST YR MAINT COST (8% of Field Hardwr Mat. Cost)	ield Hardwr Mat. Cost)	%	8.0		\$116,206			0\$		0\$		\$116,206
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က	OPERATING SYSTEM		S	0	\$0.00	0\$	\$0.00	0.0	\$0	\$0.00	0\$	\$0.00	\$0
4	APPLICATION SOFTWARE		SJ	0	\$0.00	\$0	\$0.00	0.0	\$0		\$	\$0.00	0\$
2	COMMAND SOFTWARE		rs	0	\$0.00	0\$	\$0.00	0.0	\$0		0\$	\$0.00	0\$
9	LUMP SUM TOTAL	ral			\$16,800.00	\$0	\$0.00	0:0	\$0		0\$	\$16.800.00	OŞ.
7			-										•
∞	UMCS DATABASE	SE											
6	DATABASE GENERATION		PTS	6,680	\$0.00	0\$	\$24.00	0.8	\$120,240	\$0.00	\$0	\$18.00	\$120.240
5	GRAPHIC DISPLAY GENERATION		DIAG	42	\$0.00	\$0	\$24.00	5.0	\$5,040		\$0	\$120.00	\$5.040
Ξ	GRAPHIC DISPLAY DUPLICATION	_	Æ	965	\$0.00	\$0	\$24.00	0.8	\$19,300		0\$	420.00	¢10 300
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2	UMCS CENTRAL EQUIPMENT	EQUIPMENT											
က	CENTRAL OPERATOR STATION	NC	EA	-	\$8,400.00	\$8,400	\$22.00	12	\$265	\$0.00	9	\$8,665.00	\$8,665
4	ALARM PRINTER		EA	-	\$720.00	\$720	\$0.00	0.0	0\$	\$0.00	0\$	\$720.00	\$720
2	LOGGING PRINTER (LASER)		EA	1	\$2,244.00	\$2,244	\$0.00	0:0	0\$	\$0.00	\$0	\$2,244.00	\$2,244
9	FIBER OPTIC MODEM		EA	22	\$624.00	\$13,728	\$0.00	0.0	0\$	\$0.00	S	\$624.00	\$13,728
7	TELEPHONE MODEM		EA	-	\$360.00	\$360	\$22.00	4	\$98	\$0.00	0\$	\$457.62	\$458
∞	PORTABLE TEST SET		Ð	1	\$1,800.00	\$1,800	\$0.00	0.0	0\$	\$0.00	\$	\$1,800.00	\$1,800
6	INSTALLATION AND TESTING		S	-	\$0.00	0\$	\$22.00	358	\$7,875	\$0.00	\$0	\$7,875.00	\$7,875
9													
=	REMOTE WORKSTATION NO. 1	-	Æ	-	\$11,988.00	\$11,988	\$22.00		\$265.00	\$0.00	O\$	\$12,253.00	\$12,253
12	REMOTE WORKSTATION NO. 2	.2	E	-	\$11,988.00	\$11,988	\$22.00	12	\$265.00	\$0.00	0\$	\$12,253.00	\$12,253
13	REMOTE WORKSTATION NO. 3	.3	Æ	-	\$11,988.00	\$11,988	\$22.00	15	\$265.00		\$0	\$12,253.00	\$12,253
72	REMOTE WORKSTATION NO. 4	.4	EA	-	\$11,988.00	\$11,988	\$22.00	12	\$265.00		0\$	\$12,253.00	\$12,253
15	REMOTE WORKSTATION NO. 5	.5	EA	1	\$11,988.00	\$11,988	\$22.00	12	\$265.00	\$0.00	\$0	\$12,253.00	\$12,253
16	REMOTE WORKSTATION NO. 6	.6	EA	1	\$11,988.00	\$11,988	\$22.00	12	\$265.00	\$0.00	O\$	\$12,253.00	\$12,253
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TEW SUBMITTALS	7	MAINTENANCE TRAINING		EA	-	\$0.00	\$0	\$22.00	255	\$5,600.00	\$0.00	\$0	\$5,600.00	\$5.600
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AREA	ACTIVITY	TY				LOCATION				AMENDMENT NO.	NO.		
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EEAP, F	EEAP, Feasibility Study for Installation of UMCS		ļ	ŀ					7	DACA01-94-D-0033	0033		
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			Onit	Š.				Manhrs					
Line	Item Description		ō	ō	Onit		Cuit	beľ		ni C		nii Onii	
Š.			Meas.	Units	Cost	Total	Cost	Unit	Total	Cost	Total	Cost	Total
-	ALTERNATIVE NO. 1												
2	DOCUMENTATION AND SUBMITTALS	MITTALS											
3	DOCUMENTATION		rs	+	\$0.00	0\$	\$75.00	299	\$50,000	\$0.00	\$0	\$50,000.00	\$50,000
4					TO BE SEED OF THE								
5	TESTING												
9	FACTORY TEST		rs	-	\$0.00	\$0	\$22.00	455	\$10,000	\$0.00	\$0	\$10,000.00	\$10,000
7	PERF. VERIFICATION TEST		S	1	\$0.00	\$0	\$22.00	545	\$12,000	\$0.00	0\$	\$12,000.00	\$12,000
8	ENDURANCE TEST		SJ	-	\$0.00	\$0	\$22.00	455	\$10,000	\$0.00	O\$	\$10,000.00	\$10,000
6	OPPOSITE SEASON TEST		rs	-	\$0.00	0\$	\$22.00	227	\$5,000	\$0.00	0\$	\$5,000.00	\$5,000
10	CONTRACTOR FIELD TEST (DIGITAL)		PNT	2,922	\$0.00	\$0	\$22.00	0.75	\$48,213	\$0.00	\$0	\$16.50	\$48,213
1	CONTRACTOR FIELD TEST (ANALOG)	(6	PNT	6,830	\$0.00	\$0	\$22.00	0.75	\$112,695	\$0.00	\$0	\$16.50	\$112,695
12	TOTAL TESTING					\$0			\$197,908				\$197,908
13													
14													
15													
16													
17													
18													
19													
70													
21													
22													
23													
24												·	
52													
56	TOTAL THIS PAGE					0\$			\$247,908		\$0		\$247,908
PREPARED BY	ED BY APPROVED BY	VED BY				TITLE OR ORGANIZATION	ZATION			DATE			
	AJN		DEJ				EMCEngineers, Inc.	ers, Inc.			-	12/13/95	
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	ENGINEER'S OPINION OF PROBABLE COST	ON OF PROBAB	LECO	ST				55	SHEET	9		0F	10
AREA		ACTIVITY				LOCATION				AMENDMENT NO.	NO.		
						Ft. Riley, Kansas							
PROJEC	PROJECT TITLE						CONTRACT NO.						
EEAP, F	EEAP, Feasibility Study for Installation of UMCS	of UMCS							_	DACA01-94-D-0033	0033		
					MATERIAL COST	L COST	1	LABOR COST		EQUIPMENT COST	NT COST	TOTAL COST	COST
			Unit	No.				Manhrs					
Line	Item Description	ription	ğ	ō	nit C		Onit	ber		Unit		Cuit	
Š			Meas.	Units	Cost	Total	Cost	Chit	Total	Cost	Total	Cost	Total
-	ALTERNATIVE NO. 1												
2	FIELD HARDWARE	DWARE											
3	FIELD HARDWARE FOR BLDG SYST.	G SYST.	S	-	\$1,452,577	\$1,452,577	\$22.00	44,017	\$968,385	\$0.00	O\$	\$2,420,962	\$2,420,962
4	(Includes cost for field panels)												
5													
9	FIELD HARDWARE SUBTOTAL	RE SUBTOTAL				\$1,452,577			\$968,385				\$2,420,962
7													
8	FIBER OPTIC DTM	TIC DTM											
6	UNDERGROUND DTM CONDUIT	TIDI	S	-	\$326,908	\$326,908	\$22.00	906'6	\$217,939	\$0.00	\$0	\$544,847.00	\$544,847
10	(134,158 LF)												
=													
12													
13													
14													
15													
16													
17													
18													
19													
20													
21													
22													
23													
24													
25													
56	TOTAL THIS PAGE					\$1,779,485			\$1,186,324		0\$		\$2,965,809
PREPARED BY		APPROVED BY	i			TITLE OR ORGANIZATION	ATION			DATE		4	
	AJN		DET				E M C Engineers, Inc.	eers, Inc.				12/13/95	

	ENGINEER'S OPINION OF PROBABLE COST	ON OF PROBAE	LE CO	ST				- 57	SHEET	7		P.	5
AREA		ACTIVITY				LOCATION				AMENDMENT NO.	NO.		
						Ft. Riley, Kansas							
PROJE	PROJECT TITLE	SOMI					CONTRACT NO.		_	2000 0 0000	coor		
נוצע	reasionity study for installation of	DINICO						1000		-0-46-0-4-0-	0000		
			:	 :	MATERIAL COST	LCOSI		LABOR COST		EQUIPMENT COST	NT COST	TOTAL COST	COST
<u>.</u>	Item Description	intion	<u> </u>	ō, jo	į		Unit	Manhrs		i i i		ţ	
Š			Meas.	Units	Cost	Total	Cost		Total	Cost	Total	Cost	Total
-	ALTERNATIVE NO. 1												
2	ACM REMOVAL - GLOVEBAG METHOD	METHOD											
က	BUILDING 222		Ē	5	\$12.00	\$60	\$32.00	1.6	\$256	\$6.50	\$33	\$69.70	\$349
4	BUILDING 610		Æ	5	\$12.00	\$60	\$32.00	1.6	\$256	\$6.50	\$33	\$69.70	\$349
5	BUILDING 723		Ę	7	\$12.00	\$84	\$32.00	1.6	\$358	\$6.50	\$46	\$69.70	\$488
9	BUILDING 5000		Ē	4	\$12.00	\$48	\$32.00	1.6	\$205	\$6.50	\$26	\$69.70	\$279
7	BUILDING 5315		EA	2	\$12.00	\$84	\$32.00	1.6	\$358	\$6.50	\$46	\$69.70	\$488
8	BUILDING 7024		EA	8	\$12.00	96\$	\$32.00	1.6	\$410	\$6.50	\$52	\$69.70	\$558
ნ	BUILDING 7033		EA	3	\$12.00	\$36	\$32.00	1.6	\$154	\$6.50	\$20	\$69.70	\$209
9	BUILDING 7050		EA	2	\$12.00	\$24	\$32.00	1.6	\$102	\$6.50	\$13	\$69.70	\$139
=	BUILDING 7086		EA	3	\$12.00	\$36	\$32.00	1.6	\$154	\$6.50	\$20	\$69.70	\$209
12	BUILDING 7243		EA	2	\$12.00	\$24	\$32.00	1.6	\$102	\$6.50	\$13	\$69.70	\$139
13	BUILDING 7285		EA	4	\$12.00	\$48	\$32.00	1.6	\$205	\$6.50	\$26	\$69.70	\$279
14	BUILDING 7602 (did not qualify)	(,	EA	0	\$12.00	0\$	\$32.00	1.6	0\$	\$6.50	O\$	\$69.70	\$0
15	BUILDING 7606		EA	9	\$12.00	\$72	\$32.00	1.6	\$307	\$6.50	\$39	02'69\$	\$418
16	BUILDING 7608 (did not qualify)	()	EA	0	\$12.00	0\$	\$32.00	1.6	0\$	\$6.50	0\$	\$69.70	\$0
17	BUILDING 7612		EA	8	\$12.00	96\$	\$32.00	1.6	\$410	\$6.50	\$52	\$69.70	\$558
48	BUILDING 7614		ĘĄ	8	\$12.00	96\$	\$32.00	1.6	\$410	\$6.50	\$52	\$69.70	\$558
19	BUILDING 7616		EA	8	\$12.00	96\$	\$32.00	1.6	\$410	\$6.50	\$52	\$69.70	\$558
70	BUILDING 7618		EA	3	\$12.00	\$36	\$32.00	1.6	\$154	\$6.50	\$20	\$69.70	\$209
21	BUILDING 7620		Ą	3	\$12.00	\$36	\$32.00	1.6	\$154	\$6.50	\$20	\$69.70	\$209
52	BUILDING 7622		ĘĄ	2	\$12.00	09\$	\$32.00	1.6	\$256	\$6.50	\$33	\$69.70	\$349
23	BUILDING 7626		EA	3	\$12.00	\$36	\$32.00	1.6	\$154	\$6.50	\$20	\$69.70	\$209
24	BUILDING 7630		EA	3	\$12.00	\$36	\$32.00	1.6	\$154	\$6.50	\$20	\$69.70	\$209
22	BUILDING 7636		EA	4	\$12.00	\$48	\$32.00	1.6	\$205	\$6.50	\$26	\$69.70	\$279
56	TOTAL THIS PAGE					\$1,212			\$5,171		\$657		\$7,040
PREPARED BY	RED BY	APPROVED BY				TITLE OR ORGANIZATION	ATION			DATE			
	NLA		DEJ				E M C Engineers, Inc.	ers, Inc.				12/13/95	

	ENGINEER'S OPINION OF PROBABLE COST	JION OF PROBAE	TE CO	ST					SHEET	a		ä	Ę
AREA		ACTIVITY				LOCATION				AMENDMENT NO		5	2
		-				Ft. Riley, Kansas					j E		
PROJE	PROJECT TITLE						CONTRACT NO.						
EEAP,	EEAP, Feasibility Study for Installation of UMCS	of UMCS								DACA01-94-D-0033	-0033		
					MATERIAL COST	AL COST		LABOR COST		EQUIPME	EQUIPMENT COST	TOTAL COST	COST
			Cuit	Š.				Manhrs					
E. E.	Item Description	scription	ō	.	Cuit	;	Onit	ber		Chrit		Unit	
ġ Z			Meas.	Onits	Cost	Total	Cost	ji Č	Total	Cost	Total	Cost	Total
-	ALTERNATIVE NO. 1												
2	ACM REMOVAL - GLOVEBAG METHOD (cont')	AG METHOD (cont')											
3	BUILDING 7642		EA	က	\$12.00	\$36	\$32.00	1.6	\$154	\$6.50	\$20	\$69.70	\$209
4	BUILDING 7644		EA	က	\$12.00	\$36	\$32.00	1.6	\$154	\$6.50	\$20	\$69.70	\$209
2	BUILDING 7648		EA	5	\$12.00	09\$	\$32.00	1.6	\$256	\$6.50	\$33	\$69.70	\$349
ဖ	BUILDING 7652 (did not qualify)	ify)	E	0	\$12.00	0\$	\$32.00	1.6	\$0	\$6.50	0\$	\$69.70	\$0
7	BUILDING 7654		EA	4	\$12.00	\$48	\$32.00	1.6	\$205		\$26	\$69.70	\$279
∞	BUILDING 7658		Ā	9	\$12.00	\$72	\$32.00	1.6	\$307	\$6.50	\$39	\$69.70	\$418
6	BUILDING 7739		EA	4	\$12.00	\$48	\$32.00	1.6	\$205	\$6.50	\$26	\$69.70	\$279
9	BUILDING 7804		EA	7	\$12.00	\$84	\$32.00	1.6	\$358	\$6.50	\$46	\$69.70	\$488
=	BUILDING 7810		EA	8	\$12.00	96\$	\$32.00	1.6	\$410	\$6.50	\$52	\$69.70	\$558
12	BUILDING 7812		EA	80	\$12.00	96\$	\$32.00	1.6	\$410	\$6.50	\$52	\$69.70	\$558
13	BUILDING 7816		EA	8	\$12.00	96\$	\$32.00	1.6	\$410	\$6.50	\$52	\$69.70	\$558
4	BUILDING 7820		EA	3	\$12.00	\$36	\$32.00	1.6	\$154	\$6.50	\$20	\$69.70	\$209
5	BUILDING 7826		E	3	\$12.00	\$36	\$32.00	1.6	\$154	\$6.50	\$20	\$69.70	\$209
9	BUILDING 7842		EA	8	\$12.00	96\$	\$32.00	1.6	\$410	\$6.50	\$52	\$69.70	\$558
17	BUILDING 7844		Ð	œ	\$12.00	\$96	\$32.00	1.6	\$410	\$6.50	\$52	\$69.70	\$558
9	BUILDING 7846		ā	80	\$12.00	\$96	\$32.00	1.6	\$410	\$6.50	\$52	\$69.70	\$558
<u>6</u>	BUILDING 7850		E	80	\$12.00	96\$	\$32.00	1.6	\$410	\$6.50	\$52	\$69.70	\$558
20	BUILDING 7856		E	9	\$12.00	\$72	\$32.00	1.6	\$307	\$6.50	\$39	\$69.70	\$418
21	BUILDING 7858		EA	3	\$12.00	\$36	\$32.00	1.6	\$154	\$6.50	\$20	\$69.70	\$209
22	BUILDING 7865		Ę	2	\$12.00	\$60	\$32.00	1.6	\$256	\$6.50	\$33	\$69.70	\$349
23													
24	MOBILIZATION COSTS		Æ	-	\$200.00	\$200	\$40.00	20.0	\$800	\$0.00	0\$	\$1,000.00	\$1.000
25													
5 6	TOTAL THIS PAGE					\$1,496			\$6,330		\$702		\$8.528
PREPARED BY	ED BY	APPROVED BY				TITLE OR ORGANIZATION	ATION			DATE			
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	ENGINEER'S OPINION OF PROBABLE COST	ON OF PROBAB	(S) LE (S)	ST			ļ		SHEET	σ) Je	Ç
AREA		ACTIVITY				LOCATION				AMENDMENT NO			2
						Ft. Riley, Kansas							
PROJ	PROJECT TITLE						CONTRACT NO.						
EEAP,	EEAP, Feasibility Study for Installation of UMCS	UMCS			:		ĺ			DACA01-94-D-0033	-0033		
				1	MATERIAL COST	IL COST		LABOR COST		EQUIPME	EQUIPMENT COST	TOTAL COST	COST
	:	:	Cair C	ġ				Manhrs					
riue	Item Description	notion	5	ģ	Cuit		Unit	ьес		Ë		Unit	
Š.			Meas.	Units	Cost	Total	Cost	Chrit	Total	Cost	Total	Cost	Total
-	ALTERNATIVE NO. 1												
2	RADIO FREQUENCY SYSTEM FOR REMOTE SITE MONITORING	FOR REMOTE SITE MON	HTORING										
က	CAMP FUNSTON												
4	BUILDING 1470		EA	-	\$4,635.00	\$4,635	\$22.00	79	\$1,737	\$0.00	0\$	\$6.372.00	¢6 377
2	GAS METER NO. 3		EA	1	\$5,085.00	\$5,085	\$22.00	79	\$1,737		QÇ	\$6.822.00	\$6,872
ဖ	GAS METER NO. 4		EA	-	\$5,085.00	\$5,085	\$22.00	62	\$1.737		U.S.	\$6.822.00	46 97
7											3	\$0,022.00	770'00
80	CAMP FORSYTH												
6	ANZIO ELECTRIC SUBSTATION	7	Æ	-	\$5,085.00	\$5,085	\$22.00	62	\$1 737	\$0.00	9	\$6.000.00	0000
2	GAS METER NO. 5		Æ	-	\$5,085.00	\$5.085	\$22.00		\$1 737		9 6	\$0,022.00	770'00
=	GAS METER NO. 11 (Colver Apts.)	S.)	EA	-	\$5.085.00	\$5.085	00.223		101.19	90.00	04	\$6,822.00	\$6,822
12				-	000000	200,5	\$22.00	8	\$1,73/	\$0.00	20	\$6,822.00	\$6,822
13	CUSTER HILL												
14	GAS METER NO. 9		Æ	-	\$5,085.00	\$5,085	\$22.00	62	\$1 737	00	Ş	00 000 00	000
15								2	5	00:00	9	\$0,022.00	779'0¢
16	CENTRAL STATION												
17	RF SYSTEM CONNECTION		EA	-	\$1,355.00	\$1,355	\$22.00	44	\$960	00 05	Ş	¢2 345 00	80 045
18										00:00	3	\$2,313.00	616,24
19													
20													
21													
22													74.
23													
24													
56	TOTAL THIS PAGE					\$36,500			\$13,119		Ç,		\$40.610
PREPARED BY		APPROVED BY				TITLE OR ORGANIZATION	VTION		_	DATE			600
_	AJN		DEJ				E M C Engineers, Inc.	irs, fnc.			12	12/13/95	
											:	2001	

	ENGINEER & OF INION OF FROM ADEL & CO.	TABLE TO NOT	ZEE CO	- 0					SHEET	5	J	Б	9
AREA		ACTIVITY				LOCATION				AMENDMENT NO.	NO.		
						rt. Kiley, Nansas					ينا		
PROJEC EEAP, Fe	PROJECT TITLE EEAP. Feasibility Study for Installation of UMCS	fUMCS					CONTRACT NO.			DACA01-94-D-0033	0033		
					MATERIAL COST	IL COST		LABOR COST		EQUIPME	EQUIPMENT COST	TOTAL COST	COST
			Unit	Š.				Manhrs					
Line	Item Description	ription	of	ō	Onit		Cuit	ber		CPit		Unit	
Š		•	Meas.	Units	Cost	Total	Cost	Ċ.	Total	Cost	Total	Cost	Total
-	ALTERNATIVE NO. 1												
2	FO DTM AND UMCS EQUIP FOR GAS METER MONITORING	OR GAS METER MONIT	ORING										
3	MAIN POST AREA - FO DTM												
4	GAS METER NO. 1		I.F	200	\$2.44	\$487	\$22.00	0.09	\$383	\$0.00	0\$	\$4.35	\$870
z,	GAS METER NO. 2		T.	200	\$2.44	\$487	\$22.00	60:0	\$383	\$0.00	0\$	\$4.35	\$870
9	GAS METER NO. 6		4	150	\$2.29	\$343		20:0	\$3,300	\$0.00	0\$	\$3.83	\$3,643
7	GAS METER NO. 8		<u>L</u>	30	\$2.88	\$86	\$22.00	60'0	\$660	\$0.00	0\$	\$4.79	\$746
8	GAS METER NO. 10		<u>"</u>	20	\$2.88	\$144	\$22.00	0.09	\$1,100		0\$	\$4.79	\$1,244
6	GAS METER NO. 12		4	20	\$2.88	\$144	\$22.00	0.09	\$1,100	\$0.00	0\$	\$4.79	\$1,244
ę													
Ξ	MAIN POST AREA - UMCS EQUIPMENT (ACUs and Connection to Utility)	QUIPMENT (ACUS and C	onnection	to Utility)									
12	GAS METER NO. 1		EA	0.5	\$1,250.00	\$625	\$22.00	23	\$250		0\$	\$1,750.00	\$815
13	GAS METER NO. 2		EA	0.5	\$1,250.00	\$625	\$22.00	23	\$250	\$0.00	0\$	\$1,750.00	\$875
14	GAS METER NO. 6		EA	1.0	\$1,250.00	\$1,250		23		\$0.00	0\$	\$1,750.00	\$1,750
15	GAS METER NO. 8		EA	1.0	\$1,250.00	\$1,250		23	005\$		0\$	\$1,750.00	\$1,750
16	GAS METER NO. 10		EA	1.0	\$1,250.00	\$1,250			\$200		0\$	\$1,750.00	\$1,750
11	GAS METER NO. 12		EA	1.0	\$1,250.00	\$1,250	\$22.00	23	\$200	\$0.00	0\$	\$1,750.00	\$1,750
18													
19													
20													
21													
22													
23													
24													
25					1								
76	TOTAL THIS PAGE					\$7,942			\$9,426		0\$		\$17,368
PREPARED BY	ED BY	APPROVED BY				TITLE OR ORGANIZATION	IZATION			DATE			
	NLA		DEJ				E M C Engineers, Inc.	ers, Inc.				12/13/95	